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Ferroelectricity Newsletter

A quarterly update on what's happening in the field of ferroelectricity

Volume 9, Number 1 Winter 2001

FOCUSING ON THE NEXT GENERATION OF SCIENTISTS

This first isssue of the *Ferroelectricity Newsletter* in the new millennium highlights the **Third Asian Meeting of Ferroelectrics (AMF-3)** held 12—15 December 2000 in Hong Kong. A glimpse at the history of this relative newcomer to the international conferences on matters of ferroelectricity and related fields brings the rapid growth of this scientific discipline into sharp focus.

The **First Asian Meeting of Ferroelectrics,** convened 5—8 October 1995 in Xian, China, was concurrently held with the Second East Asia Conference on Chemical Sensors (EACCS-2) and the International Conference on Electronic Components and Materials with the International Conference on Sensors and Actuators (ICECM-ICSA'95). One hundred and eighty-five participants from 12 countries and regions attended the meeting. Many of the registrants of the concurrent meetings also participated in some of the academic activities of AMF-1.

The **Second Asian Meeting of Ferroelectrics** took place from 7 – 11 December 1998 in Singapore. Professors Zhu Weiguang and Yao Xi editorialized in the proceedings: "The AMF-2 received 345 abstracts and scheduled 310 (43 invited) presentations with 203 registered participants. The participants and papers came from 22 countries and regions in five continents. These figures of AMF-2 give not only a clear indication and testimony of the strong growth and active development of ferroelectric research in Asia, but also show that AMF has become an international forum for the ferroelectric community around the world, not just for the Asian community."

A significant development at **AMF-3** was the fact that among the 450 participants 130 were students from around the region, including 95 from China and 25 from Korea. This didn't just happen. In their invitation to the conference, the organizers said that this conference is "an excellent opportunity for local and regional participants, especially Asian students, to meet and interact with international scholars in the field of ferroelectrics." Obviously, the scientific community leaders understand the importance of providing advanced training for the next generation of researchers. In this context I would like to refer our readers to Professor L. Eric Cross' article "Changing conditions for younger scientists entering the ferroelectric field," published in the *Ferroelectricity Newsletter* Vol. 7, No. 1, where he takes a look at the conditions necessary to ensure a vigorous future for the ferroelectric community.

Rudolf Panholzer
Editor-in-Chief

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Ferroelectricity Newsletter

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CONFERENCE REPORT

THIRD ASIAN MEETING ON FERROELECTRICS (AMF-3)

The third Asian Meeting on Ferroelectrics was organized by the Department of Applied Physics, the Hong Kong Polytechnic University, 12 to 15 December 2000. The conference was well attended with about 450 being present and exceeded the expectations of the organisors. A majority of those present were from academic institutions, including a relatively large number of students (about 130) from around the region, including 95 from China and 25 from Korea. With such a large number in attendance, commercial vendors missed a unique opportunity to exhibit their products to this captive audience. Only AixACT, AIXTRON, Radiant Technologies, and Gordon and Breach had the foresight to exhibit at this well-attended meeting, even though many of those present would use a range of equipment and also be consumers of materials in the course of their research.

The event sponsors were AixACT and AIXTRON, both from Aachen, Germany, Gordon and Breach Science Publishers, IEEE Ultrasonics, Ferroelectrics and Frequency Control Society, the Innovation and Technology Commission from the government of Hong Kong and the Faculty of Applied Science and Textiles from the Polytechnic University. Throughout the meeting a succession of tasty meals and refreshments were provided by the University, most if not all, being sponsored by the commercial vendors. A bus tour to the Stanley Market and the Hong Kong Island Peak District, sponsored by AIXTRON, was also a popular social feature of this meeting.

The conference format included invited, oral, and poster papers, with parallel sessions being used for most of the day. More than 420 papers were presented, a number that rivals international ferroelectric meetings. A complete list of which is provided as part of this report. From recent ferroelectric meetings —and AMF-3 was no exception — it is obvious that the science of ferroelectric materials has come a long way in the last 20 years. There are state-of-the-art devices recently offered in several application areas. In addition to varactors and —— these include low integration level lead zirconium titanate (PZT) ferroelectric memories (FRAMs) for smart card and other uses. They also have a large potential market in wireless communications uses, where currently ferroelectric devices are in short supply.

Higher integration level devices such as DRAMs have recently been announced by Samsung and Matsushita. In these 4Gbit RAMs the low dielectric value silicon dioxide has been respectively replaced with high dielectric constant PZT by Samsung and by barium strontium titanate (BST) by Matsushita. In addition to personal computer uses, ferroelectric memory (FRAM) have potential audio and video applications. A 4Gbit RAM would be ideal for digital cameras and a 250 Mb is required for audio recording.

Probably the most relevant comments were provided by the members of the Applications of Ferroelectrics in the 21st Century panel during that evenings session. The panel contributors were Bob Newnham — Penn State, Jim Scott — Cambridge, Amar Bhalla – Penn State, Nara Setter – EPF Lausanne, Wolfgang Wersing – Siemens, Kenji Uchino – Penn State, Yao Xi – Tongji University, and Iko Yoo – Samsung.

Jim Scott sees the need to update the ferroelectric curriculum for students to include such topics as electrode technology and phase transitons and the requirement for a different industry offering thin film memories, starting with small devices. Nara Setter sees the need for more cross disciplines, between hardware and software, between dielectrics/ magnetics semiconductors and conductors, and between applications, fundamental research and technology. Bob Newnham sees benefits from more team work between countries to expand research and application fields. He also thought that this industry needs to be more conservative and use the knowledge to make money. It will take longer for basic research, but if applied five years ago, FRAMs would be already commercialized.

According to Iko Yoo, Samsung has PZT FRAM devices ready for production and pyroelectric emission is a promising application (above the transition temperature). Ha also stated that ferroelectric materials are ideal for the personal chip to monitor blood, temperature, etc.

CONFERENCE REPORT

According to Kenji Uchino, the current buzz words for research funding are information technology, biotechnology, and ecology and ferroelectric materials find application in all these fields. Some examples are compact ultrasonic piezoelectric transformers, 3mm size electric motors ferroelectric MEMS, compact actuators for office equipment and photo-devices that can change light ito sound without current. Ferroelectric materials can also create very large forces and will become very important for MEMS, i.e., FMEMS.

Some concern was expressed about the introduction of lead into the environment from PZT based devices, but the hazard from PZT transducers must be classed as a very minor threat to the environment when compared with the current lead exposure from üld (and new) car batteries. However, the Japanese government has limited such uses of lead to 20 years. Lead standards vary widely around the world. For example, in the USA and Europe lead is being removed from drinking water, but in Australia leaded gasoline is still used.

Although prognostications that ferroelectric behavior should disappear as the film thickness decreases, ferroelectricity is here to stay since a 3-molecular layer of poly vinylidene fluoride (PVDF) still exhibits ferroelctric behavior.

— Alan Mills

NEW PUBLICATIONS FROM MRS

Substrate Engineering—Paving the Way to Epitaxy

This volume focuses on recent developments in novel substrate engineering which enable improved epitaxy. In particular, the volume brings together groups developing and improving novel substrates with those using them for film growth and device fabrication. Topics include biaxially textured substrates for high-T_c-coated conductors; surfaces for oxide epitaxy; waver bonding and lift-off; lattice mismatch engineering; substrate engineering; and solid-phase recrystallization and epitaxy. 2000, hardcover, 28 papers, 228 pages.
Volume 587 from the MRS Symposium Proceedings Series (1999 MRS Fall Meeting, Boston, MA)
ISBN: 1-55899-495-5; $78.00 MRS members, $90.00 US list, $103.00 non-US list
Editors: David Norton, Oak Ridge National Laboratory; Darrell Schlom, The Pennsylvania State University
Nate Newman, Northwestern University; David Matthiesen, Case Western Reserve University

This volume is also available electronically on the MRS website www.mrs.org/books/ with free access for all current MRS members.

For more information on related topics, consider these volumes from MRS:

***Epitaxial Growth—Principles and Applications* (Volume 570)**
(1999 MRS Spring Meeting, San Francisco, CA) 1999, hardcover, 42 papers, 318 pages
ISBN: 1-55899-477-7; $62.00 MRS members; $73.00 US list; $80.00 Non-US list

***Mechanisms and Principles of Epitaxial Growth in Metallic Systems* (Volume 528)**
(1998 MRS Spring Meeting, San Francisco, CA) 1998, hardcover, 26 papers, 278 pages
ISBN: 1-55899-434-3; $69.00 MRS members; $79.00 US list; $90.00 Non-US list

***Evolution of Epitaxial Structure and Morphology* (Volume 399)**
(1995 MRS Fall Meeting, Boston, MA) 1995, hardcover, 79 papers, 561 pages
ISBN: 1-55899-302-9; $69.00 MRS members; $76.00 US list; $81.00 Non-US list

AMF-3 PAPERS

THIRD ASIAN MEETING ON FERROELECTRICS

The following is a list of titles and authors of oral and poster contributions given at AMF-3, held 12-15 December 2000 in Hong Kong, China.

PLENARY LECTURES

Ferroelectric and ferromagnetic microcrystalline glass ceramics
Yao Xi

Ferroelectrics: Looking back and looking ahead
Nava Setter

Recent development in high strain electroactive actuator materials
L. Eric Cross

Relaxor properties of dilute and concentrated polar solid solutions
Wolfgang Kleemann

Symmetry and antisymmetry in ferroelectric transducers
R.E. Newnham

Ferroelectric and antiferroelectric transitions in random copolymers of vinylidene fluoride and trifluoroethylene
Takeo Furukawa

Phase coexistence of hydrogen-bonded mixed crystals
Sook-Il Kwun, Keum Hwan Noh, and Jong-Gul Yoon

Studies of nanophase ferroelectric thin films for Gbit memories
J.F. Scott, M. Dawber, S.A.T. Redfern, and Ming Zhang

PROCESSING OF FERRO-ELECTRIC MATERIALS

Low temperature sintering of PZT-based thick films
Marija Kosec, Janez Holc, and Barbara Malic

Investigation of high frequency (2.45 GHz, 30 GHz) sintering for Pb-based ferroelectrics and microscale functional devices
S. Rhee, D.K. Agrawal, T.R. Shrout, and M. Thumm

Synthesis of $YMnO_3$ thin films from alkoxy-derived precursors
Kazuyuki Suzuki, Kaori Nishizawa, Takeshi Miki, and Kazumi Kato

MOCVD of barium strontium titanate capacitors for future DRAM applications
J. Lindner, M. Schumacher, F. Schienle, D. Burgess, P. Strzyzewski, and H. Jürgensen

SURFACES, INTERFACES, AND DEFECTS

Nanoscale properties of $SrBi_2Ta_2O_9$ thin films
Alexei Gruverman

Effect of BNT addition on the properties of SBT ceramic and thin films
H.X. Qin, J.S. Zhu, W.Y. Cai, P.P.Chen, W. Lun and Y.N. Wang

Domain wall dynamics and scaling of Barkhausen noise in ferroelectrics
Bosiljka Tadic

Early-stage growth behavior of laser ablated epitaxial $SrRuO_3$ thin films on $SrTiO_3$ (001)
Sang Sub Kim, Tae Soo Kang, and Jung Ho Je

SENSORS, ACTUATORS, AND MICROWAVE DEVICES

Anomalous behavior of materials properties near ferroelectric phase transitions in single crystals, ceramics, and thin films
Wolfram Wersing

Novel approach to dynamic imaging of stress distribution with piezoluminescence
Chao-Nan Xu, Hiroaki Matsui, Yun Liu, and Xu-Guang Zheng

Single and double type microwave absorber using dielectric (TiO_2) magnetic ($Fe_2O_{3)}$ composite material
Takashi Yamamoto, Mituri Saito, Tugio Sakamoto, Hirotake Niori, Masaru Chino, and Masaki Kobayashi

Effect of the electric field on the optimal properties of the obliquely cut pyroelectric crystals
Vladimir Samoylov and Yung Sup Yoon

Novel electroceramic transducers by fused deposition technique
A. Safari

Design of a new PZT-based micro-phone and microspeaker
Ren Tiang-Ling, Zhang Lin-Tao, Liu Li-Tian, and Li Zhi-Jian

Low-frequency characterization of laser ablation deposited thin $Na_{0.5}K_{0.5}NbO_3$ (NKN) films for microwave application
Saeed Abadei, Choong-Rae Cho, Alex Grishin, and Spartak Gevorgian

AMF-3 PAPERS

Improvement in material figure of merit of PLZT by samarium substitution
Chandra Prakash, O.P. Thakur, and Pran Kishan

Actuators piezoelectric ceramics and functional gradient materials
Xinhua Zhu, Jianmin Zhu, Shunhua Zhou, Qi Li, Zhiguo Liu, Naiben Ming, Zhongyan Meng, Helen Lai Wa Chan, and Chungloong Choy

Micromachined pyroelectric thin film IR sensors
W.G. Liu, J.S. Ko, and W. Zhu

Design and fabrication of microaccelerometers using piezoelectric thin films
Jyh-Cheng Yu and Fu-Hsin Lai

The oxydizing of grain boundary defects in $BaTiO_3$-based PTCR ceramics
Qi Jianquan, Gui Zhilun, and Li Longtu

Design and driving characteristics of ultrasonic linear motor
Tae Yoal Kim, Beom Jin Kim, Tae Gone Park, and Myong Ho Kim

CRYSTALS AND CERAMICS

Microwave dielectrics for tunable devices
Amar S. Bhalla

Neutron diffraction studies of $Pb(Zr_xTi_{1-x})O_3$ $0.20 \le x \le 0.54$ ceramics
Johannes Frantti, Jyrki Lappalainen, Sten Eriksson, Sergey Ivanov, Vilho Lantto, Masato Kakihana, Shigeru Nishio, and Håkan Rundlöf

Fatigue properties and microstructures of (Pb, Ca)TiO_3 ceramics
Chien-Ru Lin, Chen-Chia Chou and Dah-Shyang Tsai

Bismuth sodium titanate-based piezoelectric ceramics
Dingquan Xiao, Zheng Wan, Jianguo Zhu, and Wen Zhang

Crystal growth and electrical properties of high-Tc relaxor-PT system single crystals
N. Ichinose, Y. Saigo, Y. Hosono, and Y. Yamashita

Ferroelectric phase transition of $SrTi^{18}O_3$ studied by Brillouin scattering
Yuhji Tsujimi, Hiroki Hasebe, Ruiping Wang, Mitsuru Itoh, and Toshirou Yagi

Electrical properties of bismuth layer-structured ferroelectrics $Sr_{m-3+x}Bi_{4-x}Ti_{m-x}Ta_xO_{3m+3}$ (m=2, x=1-2; m=3, x=0-2)
Hajime Nagata, Takeshi Takahashi, Shunsuke Miyamura, and Tadashi Takenaka

Photoluminescence in heavily magnesium and erbium codoped lithium niobate
H.X. Zhung, Y. Zhou, C.H. Kam, L.S. Qiang, C.Q. Xu, and Y.L. Lam

Disordered feature in Rochelle salt
Yoich Shiosaki, Katsumi Shimizu, and Ryusuke Nozaki

THEORY AND FUNDAMENTAL PHENOMENA

A model for a phase diagram with a Lifshitz point
Ted Janssen

The grain size effect of lead titanaate glass-ceramic at microwave frequency
Zhao Peng, Yao Xi, and Zhang Liangying

Possibility of second electron gas on free ferroelectric surface and its effect on domain and size limit
Yukio Watanabe and Akihiro Masuda

Diffuse phase transition in perovskite ferroelectrics
K. Prasad

Origin of displacive type ferroelectricity in perovskite $ATiO_3$
Tetsuro Nakamura, Yue Jin Shan, Hideo Imoto, Mitsuru Itoh, and Yoshiyuki Inaguma

Theory of the morphotropic phase boundary
Yoshihiro Ishibashi

Size effect study by bulk crystals: Optical and DC dielectric response of oxygen vacant $BaTiO_3$
Yukio Watanabe, G.A. Thomas, S.W. Cheong, and M. Okano

High frequency measurements of P-E hysteresis curves of PZT thin films
Takaaki Tsurumi, Song-Min Nam, Young-Bae Kil, and Satoshi Wada

Studies of the thermal evolution of TGS single crystal by using variable-temperature electrostatic force microscopy and the effects of point defects
E.Z. Lun, Z. Xie, B. Sundaravel,

AMF-3 PAPERS

J.B. Xu, and I.H. Wilson

Relaxor-based piezocrystals: Design, synthesis, and anisotropic properties
Zuo-Guang Ye

Dynamic response of relaxor ferroelectrics
R. Pire and V. Bobnar

Origin of ferroelectricity in the perovskite ABO_3 crystals
Wataru Kinase, Kenro Nakamura, and Koji Harada

Structural phase transitions in $K_{1-x}Li_xTa_{1-y}Nb_yO_3$
V.A. Trepakov, M.E. Savinov, E. Giulotto, P. Galinetto, P. Camagni, G. Samoggia, L. Jastrabik, and S. Kapphan

MICROELECTROMECHANICAL SYSTEMS (MEMS)

Micromachined pyroelectric thin films in sensors
W.G. Liu, J.S. Ko, and W. Zhu

The effect of processing parameter on the piezoelectric coefficients of thin films
Dong-Guk Kim, Jeong-Ho Park, Il-Doo Kim, and Ho-Gi Kim

Wet chemical etching of lead circonate titanate thin film for microelectromechanical systems applications
Yin-Yin Liu, Qin Liu, Xi Yao, Wei-Ning Huang, and Tong-Ao Tang

Antiferroelectric thin films for MEMS applications
S.S.N. Bharadwaji and S.B. Krupanidhi

RELAXOR FERROELECTRICS

Electric boundary conditions on thermal strain behavior of relaxor single crystals
Ruyan Guo

Crystal structure of the relaxor ferroelectric Pb_2ScTaO_6 in the paraelectric and ferroelectric states
K.Z. Baba-Kishi and P.M. Woodward

The field and frequency dependence of the strain and polarization in piezoelectric and electrostrictive ceramics
W. Ren, A.J. Masys, G. Yang, and B.K. Mukherjee

Effective piezoelectricity of PZT-based relaxor ferroelectric compositions
Zhigiang Zhuang

PMN-PT detector and its application in electron acoustic imaging system
Q.R. Yin, J.W. Fang, H.S. Luo, and G.R. Li

Dielectric behavior and conformational disorder in polymer relaxors
B. Hilczer, H. Smogór, T. Pawlowski, S. Warchol, and M. Nowicki

A unified picture of the ordered domains in relaxor ferroelectric lead magnesium niobate
J.S. Liu, Z.R. Liu, H. Zheng, B.L. Gu, and X.W. Zhang

Composition and implication of morphotropic phase boundary in PMN-PT systems
Chen Ke-Pi, Zhang Xiao-Wen, and Fang Fei

Spontaneous ferroelectric-relaxor transition of $Pb(Zn_{1/3}Nb_{2/3})O_3$-$PbZrO_3$-$PbTiO_3$ systems near morphotropic phase boundaries
X.P. Jiang, J.W. Fang, H.R. Zeng, G.R. Li, D.R. Chen, and Q.R. Yin

Effective piezoelectricity of PZT-based relaxor ferroelectric compositions
Zhiqiang Zhuang

PMN-PT detector and its application in electron acoustic imaging systems
Q.R. Yin, J.W. Fang, H.S. Luo, and G.R. Li

Light scattering and electric properties of relaxor ferroelectric single crystals
Chi-Shun Tu, L.-F. Chen, C.-L. Tsai, and B.-J. Cheng

Radiospectroscopy investigation of relaxor ferroelectrics
M.D. Glinchuk, V.V. Laguta, I.P. Bykov, and L. Jastrabik

Domain boundary pinning and nucleation of ferroelectric $(Pb_{1-x}Sr_x)TiO_3$ ceramics
Chun-Shu Hou and Chen-Chia Chou

DIELECTRIC,PIEZOELECTRIC, AND PYROELECTRIC PROPERTIES

Fabrication of low-firing piezoelectric ceramics and their applications
Longtu Li and Zhilun Gui

Effect of Sb_2O_5 on the microwave dielectric properties of $(Zr_{0.8}Sn_{0.2})TiO_4$ ceramics
Yil Seok Ahn, Ki Hyun Yoon, and Eung Soo Kim

AMF-3 PAPERS

New functions of piezoelectrics for the superconductor
Sunao Sugihara, Yukio Yutoh, Jun-Ichi Ueki, Masayoshi, and Yumi Uzawa

Microstructural characteristics of $Ba(Mg_{1/3}Ta_{2/3})O_3$ ceramics and their microwave dielectric properties
I-Nan Lin, Mei-Hui Liang, Chen-Ti Hu, Hsiu-Fung Cheng, and John Steeds

Studies of domain walls and their effect on switching properties in PZT, SBT, and BTO
Y. Ding, J.S. Liu, and Y.N. Wang

Dielectric properties and transition temperature of ceramics in the $Pb(Mg_{1/3}Nb_{2/3})O_3$-$BaTiO_3$ system
Li Zhenrong, Li Qi, Zhang Liangying, and Yao Xi

Piezoelectric properties orthorhombic lead barium niobate ceramics
A. Bhanumathi, V.V.N. Acharya, and K. Uchino

Elastically hinged molecule model in physics of ferroelectric materials
Sergey V. Dmitriev, Kohji Abe, and Takeshi Shigenari

POLYMERS AND COMPOSITES

Ferroelectric ceramic/polymer composites and their applications
D.K. Das Gupta

Laser-induced phase transitions for patterning piezo- and pyroelectricity in ferroelectric polymers
M. Wegener and R. Herhard-Multhaupt

The relaxation properties of $PbTiO_3$ composite materials on microwave frequency
Zhai Jiwei, Yao Xi, Wu Mingzhong, and Zhang Liangying

Nonlinear dielectric permittivity of PT/PVDF-free composites
Bernd Ploss, Beatrix Ploss, F.G. Shin, H.L.W. Chan, and C.I. Choy

FERROELECTRIC THIN FILMS

Chemical deposition methods for ferroelectric thin films
Rainer Waser, Theodor Schneller, Peter Ehrhard, and Susanne Hoffmann

Ferroelectric phase transitions in films with depletion charge
A.P. Levanyuk and A.M. Bratkovsky

MOCVD of barium strontium titanate capacitors for future DRAM applications
J.Lindner, M. Schumacher, F. Schienle, D. Burgess, P. Strzyzewski, and H. Jürgensen

Intrinsic hysteresis loops in ferroelectric film systems
Khian-Hooi Chew, Lye-Hock Ong, Junaidah Osman, Eng-Kiang Tan, and D.R. Tilley

Effect of composition and growth temperature on the dielectric properties of $Pb(ScTa)_{1-x}Ti_xO_3$ (PSTT) thin films grown by MOCVD
C.H. Lin, P.A. Friddle, C.H. Ma, and Haydn Chen

Sol-gel derived $(Ba_{0.5}Sr_{0.5})TiO_3$ thin films on the electrical properties and reliability of PZT thin film capacitors
Wangkyu Liu, Jungryul Ahn, Sungho Choo, Youngman Kim, and Jaichan Lee

Ga_2O_3 thin films prepared from sol-gel process for oxygen and ozone gas sensing
Yongxiang Li, Kosmas Galatsis, Wojtek Wlodarski, and John Gorman

Ferroelectricity in nanostructured materials
Yuhuan Xu and J.D. Mackenzie

Electrical properties of novel fluorite/spinel heteroepitaxial double buffer layer structure on Si(001) for FET-type FRAM application
Naoki Wakiya, Kazuo Shinozaki, and Nobuyasu Mizutani

Interfacial states control of sputter deposited $Pb(Zr_{0.52}Ti_{0.48})O_3$ thin films
Soon Mok Ha, Woo Sik Kim, and Hyung-Ho Park

Stability and read/write characteristics of nano ferroelectric domains
Kwangsoo No, Seungbum Hong, and Jungwon Woo

Fabrication and characterization of low dielectric constant ferroelectric material for field effect transistor
Woo Sik Kim and Hyung-Ho Park

Physical characterization and electrical properties of chelating-agents doped PZT thin films
Te-Cheng Mo and San-Yuan Chen

AMF-3 PAPERS

The $(Ba_{0.5}SR_{0.5})TiO_3$ ferroelectric thin films prepared by sol-gel processing
Gu Haoshuang, Zhao Min, and Yang Guang

Aging effects on the ferroelectric properties of $YMnO_3$ thin films
H.Y. Guo, Ian H. Wilson, J.B. Xu, E.Z. Luo, W.Y. Cheung, N. Ke, and B. Sundar

GLASSES, DOMAINS, AND BOUNDARIES

The nature of the glass transition in canonical glasses: A look behind the "time trap"
Jan K. Krüger

Observation on creation and annihilation of 90˚ domain in $BaTiO_3$ by scanning probe microscopy
Sin Ichi Hamazaki, Fuminao Shimizu, Yoshiu Takahashi, and Masaaki Takashige

Ellipsometric study of optical anisotropy of SBT thin films
D. Mo, J.B. Xu, Y. Liu, X. Wang, and G.D. Hu

Fast relaxation of some relaxor ferroelectric crystals by micro-Brillouin scattering
Seiji Kojima, Fuming Jiang, and Qingrui Yin

NOVEL MATERIALS AND EXPERIMENTAL TECHNIQUES

High frequency LIMM experiments and data analysis on ceramic thin films
Sidney B. Lang

Calorimetric study of ferroelectromagnetic crystals, $KYMnO_3$, $ErMnO_3$, and $LuMnO_3$
Toru Kyomen, Minoru Morita, Mitsuru Itoh, and Kay Kohn

Light-induced ESR of dye-doped KDP
Tomoyuki Hikita, Matsubo Tanimoto, Yosiaki Uesu, and Boris A. Strukov

Electronic ferroelectricity in ZnO
S. Hagino, K. Yoshio, T. Yamazaki, T. Kubo, H. Sato, K. Matsuki, and A. Onodera

OPTICAL PROPERTIES AND NONLINEAR PHENOMENA

Light-induced absorption in pure and Fe-doped BCT crystals
Maria Wierschem, Thiemo Lindemann, Siegmar Kappham, and Rainer Pankrath

Proton exchanged $LiNBO_3$ optical waveguides: Nonlinear electro-optical and photorefractive properties
Yuri N. Korkishko, Vyacheslav A. Fedorov, Evgeny A. Baranov, Tamara V. Morozova, Sergey M. Kostritskii, and Fredrik Laurell

Photoluminescence and triboluminescence of ferroelectric PZT at room temperature
Yun Liu, Chao-Nan Xu, Morito Akiyama, and Tadahiko Watanabe

Holographic storage properties of $Mn:Fe:LiNbO_3$
Xu Wusheng, Wang Rui, Shi Shaojun, Chen Xiaojun, and Wu Zhongkang

POSTERS

NOVEL MATERIALS AND EXPERIMENTAL TECHNIQUES

Wet chemical synthesis of $BaTiO_3$ powders and characteristics of the sintered ceramics
Zhiqiang Zhuang, Xin Wang, and Hainiu Zhou

Novel electrooptic polymer film
Fang Changshui, Shi Wei, Pan Qiwei, Gu Qingtian, and Wu Xiangwen

Preparation of sol-gel derived glass-ceramic with pure nanosized barium titanate crystals
Zhao Peng, Yao Xi, and Zhang Liangying

Hydrothermal synthesis of lead magnoniobate powder
Wei Xiaoyong, Wang Minqiang, and Yao Xi

Superconductor/ferroelectric heterostructures
Li Lin, Hu Wenfei, Zhao Xinxjie, Chen Yingfei, and Wang Tiansheng

Research on the dielectric and ferroelectric characteristics of $(Pb_{1-x}Sr_x)\ TiO_3$ ceramics
Mao-Xiang Wang, Tong Sun, and Ping Sun

Crystal structures of $BaMgF_{4-x}O_{x/2}$ thin films
Xiaoli Wang, Shinobu Fujihara, and Toshio Kimura

High pressure synthesis and properties of a perovskite $Bi_{1/2}Ag_{1/2}TiO_3$
Yoshiyuki Inaguma, Kazuhisa

AMF-3 PAPERS

Kobashi, Misuru Itoh, Yue-Jin Shan, and Tetsuro Nakamura

Crystal structure of ZnO:Li at 293 K and 19 K by X-ray diffraction
Keiji Yoshio, Akiro Onodera, Hiroyasu Satoh, Naboru Sakagami, and Haruyasu Yamashita

Effect of Cu-doping on II-VI semiconducting ZnO
H. Satoh, K. Yoshio, T. Yamasaki, K. Matsuki, I. Shimono, N. Sakagami, and A. Onodera

EPA detection of the anisotropic internal electric field and soft mode in the liquid-crystalline chromium (III) mesogen
N.E. Domracheva, I.V. Ovchinnikov, G. Lattermann, and A. Facher

Ferroelastic phase transitions in triethylammonium and piperidinium chloroantimonate (V)
B. Bednarska-Bolek, G. Bator, and R. Jakubas

PZT ferroelectric films
A. Deineka, M. Glinchuk, L. Jastrabik, G. Suchanek, and G. Gerlach

Dielectric behavior of low-temperature sintered planar Z-type hexaferrite with Cu modification
Jianer Bao, Ji Zhou, Longtu Li, Hongguo Zhang, Zhenxing Yue, and Zhilun Gui

Low-fire and high-performance Y5P dielectrics for high voltage multilayer ceramic capacitors
Xiukai Cai, Chunlei Wang, Peilin Zhang, Jinfeng Wang, Weilie Zhong, Liangying Zhang, and Xi Yao

Synthesis and application studies of castol oil/poly(methyl methacrylate) IPNs
Tang Dongyan, Cai Weimin, and Zhou Derui

Study of technology parameters of preparing electrode materials of ß-$Ni(OH)K_2$ nano powders
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Effect of atmosphere on dielectric and ferroelectric properties of PZT thin films produced by oxide precursors
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Properties of lead magnesium niobate thin films obtained by pulsed laser deposition
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Low voltage switching in $Pb(Zr_xTi_{1-x})O_3$ thin films
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Resonance characteristics of lead zirconate titanate/epoxy 1-3 composite rings
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Study of thickness dependence on electrical properties of (Pb,La)TiO_3 thin films for memory applications
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Physical characteristics of photosensitive sol-gel derived PZT films for microcantilever
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CONFERENCE REPORT

FERROELECTRICS 2000 UK

*We are happy to bring you information on the Ferroelectrics 2000 UK conference. First, we reprint the foreword of the proceedings of Ferroelectrics 2000 UK, published by IOM Publications at the end of last year. (*Ferroelectrics 2000 UK*, Neil McN Alford and Eric Yeatman eds., IOMCommunications Ltd ISBN 1-86125-135-1) Second, we list the authors and titles of the papers given at the conference.*

Foreword

The first Institute of Materials Congress was held in 1998 on the campus of the Royal Agricultural College, Cirencester, Wiltshire. As part of this congress, a meeting on functional materials was organised by the instiutute's Electronic Applications Divisional Board (EADB). That meeting was very successful, and its proceedings were published as *Growth and Processing of Materials for Electronics*, N. McN. Alford Ed., Inst. of Materials Publishing (1998). Ferroelectrics emerged as a particularly strong theme within this meeting.

Consequently, the EADB organised a three day follow-on meeting, Ferroelectrics 2000 UK, within the general theme of Functional Materials at the Institute's Materials Congress 2000 (also at Cirencester). The meeting was remarkably successful, with the highest participation of any Congress session. This is perhaps unsurprising; ferroelectric materials are used in an enormous range of electronic devices, with a world market of tens of billions of dollars per annum. Applications include piezoelectric devices (transducers, sensors, filters etc.) microwave communications filters, uncooled infra-red detectors and imagers, displays and other optical devices, memories, and the rapidly growing field of micro-electro-mechanical systems (MEMS). The UK has taken a leading role in the development of many of these. The aim of the symposium was to provide a platform for displaying the UK's materials research and device developments in this exciting field, and a workshop for discussing the directions of the developments in ferroelectrics for the next millennium. The symposium incorporated the Fifth UK Transducer Materials and Transducers Workshop, and was organised as a bridge between the IoM Ceramics Division Congress and the IoM Congress 2000. The organising committee, and the meeting itself, were chaired by Professor Roger Whatmore; other committee members were Caroline Millar, David Hall, Robert Freer, Steve Mahon and ourselves. The sessions were lively and productive, reflecting the fact that the subject area is of growing importance within the UK and indeed worldwide. Plans for further collaboration between the members of the UK community are already in progress.

A very wide range of papers of excellent quality was presented, in the areas of processing, structural analysis, modelling, mechanical and electrical behaviour, MEMS and sensors. Following independent peer review of all submissions, we are now pleased to present these proceedings of Ferroelectrics 2000 UK. We anticipate that this volume, along with the Ferroelectrics UK meeting, will be the first of a regular series. On behalf of the Organising Committee, we express our sincere thanks to all the authors and participants .

Neil Alford
South Bank University

Eric Yeatman
Imperial College of Science Technology and Medicine

FERROELECTRICS 2000 UK PAPERS

Ferroelectric Memories 2000
J. F. Scott

Atomistic Modelling of Ferroelectric Perovskites
D. Porter

Silver and Gold Surface-Modified Platinum Electrodes on Silicon for Lead Zirconate Titanate (PZT) Thin Film Growth
Rab Wilson, Qi Zhang and Roger W. Whatmore

A Taguchi Study of Defects in the Fabrication of PZT Ceramics
A. Navarro, C. Shaw, J. R. Alcock and R. W. Whatmore

Piezo AFM of Thin Film Lead Scandium Tantalum Oxide (PST)

CONFERENCE REPORT

Titanium Oxide (PZT)
S. Dunn and R. W. Whatmore

The Nondestructive Evaluation of Crack Nucleation and Propagation of PZT Using Piezoelectric Signals
K. Kageyama, H. Kato and Y. Matsunaga

Structure–Property Relationships in Soft PZT Ceramics
Hong Zheng, Ian M. Reaney, Peiyi Wang and William E. Lee

The Antiferroelectric/Ferroelectric Phase Boundary in the La Doped Pb(Zr, Ti)O_3
J. Knudsen, I. M. Reaney and J. C. Fitzmaurice

Modelling of 3–3 Piezocomposites
A. Perry, C. R. Bowen and S. Mahon

Piezoelectric Particulate Reinforced Nanocomposites
S. R. Panteney, R. Stevens and C. R. Bowen

Lattice Stress Gradient Determination in Thin Films from the Asymmetry of Diffraction Lione Profile
P. Sutta

Fracture of a Hard PZT Ceramic Under Compression Loading
B. L. Cheng, M. J. Reece, F. Guiu and M. Alguero

Piezoceramixcs from Mechanochemically Activated Precursors
L. Pardo, A. Moure, J. Ricote, P. Millán and A. Castro

Combined Thick-Film PZT/ Micromachined Silicon Accelerometer
S. P. Beeby, J. N. Ross and N. M. White

Electrostrictive Poly(Vinylidene Fluoride-Trifluoroethylene) Copolymers
Q. M. Zhang, V. Bharti, Z.-Y. Cheng, H. S. Xu, T. B. Xu, T. Mai and S. J. Gross

Crystallisation Kinetics Study of Sol–Gel Prepared Lead Zirzonate Titanate Thin Films
Z. Huang, Q. Zhang and R. W. Whatmore

Computed Transmission Performance of a Frequency Selective Surface with Ferroelectric Substrates
S. B. Savia and E. A. Parker

Growth and Characterisation of Lead Zirconate Titanate (30/70) Thin Films Using TiO_2 Seeding for Oxide Ferroelectric Liquid Crystal Display Application
C. P. Shaw, S. S. Roy, R. W. Whatmore, H. Gleeson, Z. Huang, Q. Zhang and S. Dunn

Viscous Processed versus Conventional Piezoelectric Ceramics: Experimental Comparisons Using Real World Devices
D. H. Pearce, G. Dolman, C. Meggs and T. W. Button

Plastic Forming Routes to Net Shape Ferroelectric Ceramics, Thick Films and Devices
B. Su, D. H. Pearce and T. W. Button

Raman Charaterisation of Ceramic Lead Zirconate Titanate
S. J. Webb, N. McN. Alford, M. Poole and M. J. Reece

$SrBi_2(Ta,Nb)_2O_9$ Ferroelectric Thin Film Capacitors by Metalorganic Decomposition
J. P. Mercurio, J. H. Yi, C. Legrand, M. Manier, P. Thomas and R. Guinebretiere

Growth of Extremely Smooth Epitaxial $SrBi_2Ta_2O_9$ Films on $SrTiO_3$ Substrates
Ashish Garg and Zoe H. Barber

Post-Growth Processing of Ferroelectric Crystals for Non-Linear Optical Devices: Fabrication and Characterisation
P. A. Thomas, Q. Jiang, T. Latham, K. B. Hutton and R. C. C. Ward

Ferroelectricity in Aurivillius Phases
I. M. Reaney, D. Suarez and W. E. Lee

Second Phase in $BaB'_{0.33}B''_{0.67}O_3$ Microwave Dielectrics
M. Li, K. M. Moulding and D. J. Barber

Paint Based Piezoelectric Thick-Film Strain Sensors
J. M. Hale and B. de Poumeyrol

Solid State Sensors for SO_3, NO_2, HCl and CO_2
G. M. Kale, L. Wang and Y. R. Hong

□

UPCOMING MEETINGS

Thirteen Anerican Conference on Crystal Growth and Epitaxy (ACCGE-13)
12 – 16 August 2001
Burlington, Vermont, USA

Scope
ACCGE-13 will provide a forum for the presentation and discussion of recent research and development activities in all aspects of bulk crystal growth and epitaxial thin film growth, with sessions integrating fundamentals, experimental and industrial growth processes, characterization, and applications. Contributed papers will be accepted in all relevant areas. In addition to focused sessions on the topics listed below, sessions will be organized based upon the topical distribution of contributed papers. The conference will include both oral and poster sessions.

Contributed Papers
Abstracts are due 15 March 2001. Authors should submit their abstracts interactively through the web site **www.crystalgrowth.org/conferences/accge13/**. If web access is not available, authors may request a paper abstract form and guidelines from the ACCGE-13 Secretariat, Tony Gentile. Authors may request a poster or oral presentation and a session topic for their presentation, but the program chairs will set the program scheduled based on the conference requirements. Late news abstracts are due 1 June 2001, and will be assigned as poster presentations. No proceedings will be published from this meeting.

Industrial Exhibit
An exhibit of apparatus, materials, and services of interest to the crystal growth community will be held in an area adjacent to the technical sessions. Vendors interested in contracting space should contact:

Larry Mann, Advanced Ceramics
PO Box 94924, Cleveland, OH 44104-4924
phone: +216-529-3959 fax: +216-529-3975 Mannl@advceramics.com

Photography Contest
A photo contest will be held during the conference. Participants are invited to submit photographs that portray scientific, technical, and artistic aspects of crystals, crystal growth, or charac terization. The deadline for submission is 15 July 2001. Guidelines on format of the entries and submission information are availabvle on the website.

Focused Sessions
Session / *Organizer; invited speakers to date*
Bulk growth of semiconductors / *D. Carlson;*
Crystal Growth Fundamentals / *R. Braun; B. Murray (SUNY Binghampton), J. Sethian (UC Berkeley), B. Spencer (SUNY Buffalo)*
Epitaxial Growth / *M. Mauk;*
Industrial Crystallization / *V. Balakrishna; L. Rowland (Sterling Semiconductors)*
In-situ Diagnostics / *A. Allerman; W. Breiland (Sandia National Laboratory)*
Macromolecular Crystallization / *A. Malkin, C. Orme;*
Modeling / *S. Motakef*
MBE for High-Speed Electronic Devices / *B. Bennett; D. Streit (TRW), B. Orr (University of Michigan)*
Microgravity Growth / *D. Matthiesen;*
Nanotechnology / *T. Kuech, D. Kaiser;*
NLO, Photorefractive & Laser Crystals / *P. Schunemann, B. Wechsler;*
OMVPE / *J. Olson, C. Wang; A. Allerman (Sandia National Laboratories), J. Olson (National Renewable Energy Laboratory)*

UPCOMING MEETINGS

OMVPE for Optoelectronic Materials / *C. Ebert, K. Campbell; C. Joyner (Bell Laboratories), C. Miner (Nortel Networks)*
Oxides: Substrates and Films / *P. Salvador;*
Si Crystal Growth for Photovoltaic and Electronic Applications / *T. Ciszek;*
SiC Bulk Crystal and Epitaxial Growth / *I. Bhat, V. Heydemann; D. Larkin (NASA), R. Leonard (Cree Research)*
Wide Band Gap Materials: Nitrides / *R. Biefeld; R. Molnar (MIT Lincoln Laboratory), M. Manfra (Bell Laboratories)*
X-ray Diffraction for Crystal Perfection and Growth / *A. Chernov, I. Robinson; J. Tischler (Oak Ridge National Laboratory), B. Stephenson (Argonne National L:aboratory)*

AACG Crystal Growth Awards
The *Young Author Award* for fresh and imaginative contributions to the field of crystal growth and the *Gentile Service Award* for exemplary service to AACG will be presented at ACCGE-13. Details on the nomination process are available on the website.

Conference Organizing Committee

- Conference Chairs - *Debra Kaiser, Steve Licht*
- Program Chairs - *Gary Ruland, Christine Wang*
- Local Arrangement - *David Bliss, Peter Schunemann*
- Vendor Exhibit - *Larry Mann*
- Industrial Support - *Vijay Balakrishna, Vincent Fratello*
- Government Support - *Robert Biefeld, Patricia Morris*
- Awards - *Eric Monberg, Rose Scripa*
- Photography Contest - *Lara Keefer, Glen Kowach*
- Publicity - *Katherine Gudgel, Keith Torrance*
- Financial Aid - *David Bliss*
- Webmaster - *Eric Monberg*
- Foreign Liaison - *Eric Monberg*

"Advanced Materials for Novel Microwave Devices"
Special Focused Session at the 2001 Asia Pacific Microwave Conference (APMC 2001)
3 – 6 December 2001, Taipei, Taiwan

Call for Papers
Authors are invited to submit original contributions in the area of dielectrics, ferroelectrics, and ferrites in the form of bulk ceramics, tapes, and thin films, materials or devices for application at RF and microwave frequencies to be published in the *APMC Proceedings Digest*.

Guidelines for submissions are available at the APMC 2001website: **www.ee.ntu.edu.tw/apmc2001**. The manuscripts should be submitted electronically at the APMC 2001 website on or before 1 April 2001.

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APMC 2001 Secretariat, Prof. Jean-Fu Kiang, Department of Electrical Engineering, National Taiwan University
fax: +866-2-2365-1744; Apmc2001@ew.ee.ntu.edu.tw

CALENDAR OF EVENTS 2001

Mar 5-8	•	"Active Materials: Behavior and Mechanics (ss08)," Part of SPIE's 8th International Symposium on Smart Structures and Materials, Newport Beach, California, USA (see *Ferroelectricity Newsletter,* Vol. 8, No. 4, p. **22**)
Mar 11-14	•	13th International Sympoium on Integrated Ferroelectrics (ISIF 2001), Colorado Springs, Colorado, USA (see *Ferroelectricity Newsletter,* Vol. 8, No. 4, p. 32)
Apr 16-20	•	MRS 2001 Spring Meeting, San Francisco, California, USA (see *Ferroelectricity Newsletter,* Vol. 8, No. 4, p. 33)
Aug 5-11	•	8th International Conference on Ferroelectric Liquid Crystals (FLC 2001), Washington, D.C., USA (see *Ferroelectricity Newsletter,* Vol. 8, No. 4, p. 34)
Aug 12-16	•	13th American Conference on Crystal Growth and Epitaxy, Burlington, Vermont, USA (see p. 26)
Sep 3-7	•	10th International Meeting on Ferroelectricity (IMF-10), Madrid, Spain (see *Ferroelectricity Newsletter,* Vol. 8, No. 4, p. 35)
Dec 3-6	•	"Advanced Materials for Noveel Microwave Deviceds" **at the 2001 Asia-Pacific Microwave Conference (APMC 2001), Taipei, Taiwan (see p. 27)**

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